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Editorial

Obesity and COVID -19: Two Pandemics with Poor Outcomes

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Obesity is a major health problem faced by many countries including low-middle income country (LMIC). In 2016, 39% of adults aged 18 years and over were overweight, and 13% were obese (11% men and 15% women). Both overweight and obesity have shown a marked increase over the last four decades. The worldwide prevalence of obesity nearly tripled between 1975 and 2016.[(1)] On the basis of these data, the author agrees with Gammone[(2)] who categorizes obesity as a pandemic, in contrast to Dian in the currently published article, that obesity is an epidemic. Dian has discussed in detail the relationship between obesity as a high-risk factor for COVID-19 mortality and its management.

It is well known that obesity is associated with other health problems, including hypertension, high cholesterol, diabetes, cardiovascular disease, respiratory problems, musculoskeletal disease (arthritis) and some forms of cancer.[(1,3)] Obesity is closely related to metabolic syndrome (MetS). MetS is a cluster of abnormalities that includes diabetes mellitus (DM), morbid obesity, dyslipidaemia, and hypertension which are risk factors for developing cardiovascular disease (CVD) and chronic kidney disease (CKD).[(4)] The prevalence of MetS on average is 31%, and associated with a two-fold increase in the risk of coronary heart disease, cerebrovascular disease, and a 1.5-fold increase in the risk of all-cause mortality.[(5)]

Furthermore, based on available data, obesity was found to be associated with a higher risk of developing severe pneumonia and death among COVID-19 patients.[(6)] Even obese COVID-19 patients were also associated with a higher prevalence of long-Covid-19 compared to non-obese COVID-19 patients.[(7)] Patients with metabolic syndrome were nearly five times more likely to require intensive care and a ventilator or to experience respiratory distress and 3.4 times more likely to die from infection.[(8)]Compared with patients with normal body mass indexes (BMI), the risk of hospital admission was 28% and 30% higher in patients with moderate and severe obesity, respectively.[(9)] Other data also show that

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obesity and diabetes are associated with an increased likelihood of hospitalization, requiring intensive care and ventilation.[8,10]

Obesity is linked to Poor COVID-19 Outcomes

Obesity is associated with impaired ability to fight infection, including SAR-CoV-2 infection and is believed to be a major risk factor for the development of severe COVID-19 infection and mortality.[9] Results from a systematic review and meta-analysis of 75 studies on obesity and COVID-19 found that obese people were 1.5 times more likely to be infected with the coronavirus than their non-obese counterparts, 2.1 times more likely to be hospitalized because of their infection, were 1.7 times more likely to be admitted to the ICU, and 1.5 times more likely to die from the virus.[10] Patients aged under 60 yearsold with a BMI of 30–34 kg/m^2 were two and 1.8 times more likely to be admitted to acute and critical care, respectively, compared with individuals with BMI 30 kg/m^2, with the risk escalating for BMI 35 kg/m^2 (2.2 and 3.6 times, respectively).[11]

The exact mechanism by which obese people increase the risk of developing severe manifestations of COVID-19 is not yet known. However, there are several potential mechanisms, such as chronic systemic phlogistic states, dysfunctional and delayed immune responses, and even adipose tissue itself.[2] Metabolic derangement and chronic inflammation of the adipose tissue depots leading to blunted macrophage activation and impaired T and B lymphocyte responses.[12]

- Adipose tissue as a reservoir for SARS-CoV-2 that increases viral load. This is because the level of ACE2 expression in adipose tissue is higher than that in lung tissue, so obese individuals (with more adipose tissue), produce greater amounts of ACE2.[13]
- Obesity is also characterized by increased activation of the systemic and local adipose tissue renin-angiotensin system, thus ACE2 in adipose tissue may be closely related to susceptibility to COVID-19, which results in poor outcomes for obese patients.[14]
- Adipose tissue represents an independent endocrine organ. It releases a great number of bioactive peptides, collectively named “adipokines,” which play a central role in both immunity and vascular homeostasis.[2]
- Adipose tissue is also a source of many pro-inflammatory mediators and hormones, which regulate a low-grade inflammation and hypercoagulable states.[2]

There were high baseline serum levels of C reactive protein (CRP) and interleukin 6 (IL-6), as well as hypoadiponectinemia and hyperleptinemia/leptin resistance (typical of obesity).[2] Above conditions explains the pre-existing inflammatory microenvironment in obese patients, making them more susceptible to worse outcomes and even death. Both excess adipose accumulation and loss of lean mass can affect entire body function. These changes may impair not only the immunological response to the virus, but also inflammatory reactions, respiratory and metabolic disturbances. In addition, in the long term, can be the length of time required for recovery, long-term risks, and acquired weakness in the intensive care unit, which globally increase the risk of critical illness and death.[2]

Obesity as a Risk Factor for Long- COVID

Long-COVID has been defined as the persistence of symptoms, or the development of new symptoms, relating to SARS-CoV-2 infection late in the course of COVID-19, at least

28 days after diagnosis. Symptom frequency could be constant or fluctuate, and it may involve other systems.[15] Emerging data indicate that some COVID-19 survivors experience symptoms beyond the usual recovery time of SARS-CoV-2 infection. These symptoms and problems, collectively called the postacute sequelae of COVID-19 (PASC), can range from mild to disabling severity and can affect different body organs and systems.[16]

As described above, obese patients are at risk for long-term disabilities.[2,16] Based on the study results, it has been proven that obesity affects clinical manifestations, immune function and endocrine metabolism in patients discharged after recovering from COVID-19.[6] However, the specific mechanism by which obesity leads to residual symptoms after discharge and abnormal laboratory results is still unclear.[7] The factors associated with this risk may be related to problems associated with obesity itself, which is a proinflammatory and pro-thrombotic disease condition, which has higher inflammatory cytokines than nonobese individuals. Several factors that may underlie the long-term effects of obesity on hospital discharge COVID-19 patients are as follows:

- Increased inflammatory response caused by excessive cytokine release, resulting in oxidative stress that results in abnormal liver function, elevated uric acid levels, and higher lipids in obese patients than in non-obese patients.[7]
- Changes in eating habits and lack of physical activity during the pandemic, which can cause metabolic disorders in COVID-19 patients after being discharged.[16]
- Obesity is known to be associated with decreased lung function and adverse reactions to mechanical ventilation.[17]
- Physiologically, increased body weight is associated with decreased functional residual capacity (FRC) and decreased expiratory reserve, which restricts expiratory flow and induces airway closure, thereby decreasing lung diffusion capacity in obese individuals.[18]
- Pre-existing medical conditions (e.g hypertension, hyperlipidemia, diabetes), which are known to be closely related to obesity.
- The effect of certain drugs that were routinely consumed previously related to the problem of increasing BMI.
- Vaccines are known to be less effective in obese people than non-obese.[2]
- Dietary problems and activity restrictions associated with COVID-19 that can exacerbate obesity in individuals

Finally, it is clear that obesity is a major health challenge due to its high and rapidly increasing prevalence and is associated with an increased risk of various diseases that contribute to decreased quality of life and life expectancy. Reducing the burden of obesity requires an approach that combines individual interventions with environmental and social changes, including government policies on strict regulation of information warning labels on packaged foods high in sugar, fat, and salt, and limiting the marketing of unhealthy foods, especially to children. In light of the COVID-19 pandemic, it has been shown that obesity is associated with an increased incidence of mortality and morbidity and a higher prevalence of long-COVID than non-obese COVID-19 patients. By having a higher adverse outcome, individuals with higher BMI are potentially classified as high risk and, therefore, prioritized for COVID-19 testing and closer management and monitoring.

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